manners and customs of our Government Departments in relation to science will be surprised to hear that this magnificent offer was refused; and it is to prevent a like disastrous mistake being now made that the strong memorial was presented to Lord Salisbury.

The ideal arrangement for a great national collection of scientific apparatus which is to do for the sciences of experiment and observation what the British Museum does for literature and antiquities, the Natural History Museum for biology, and the National Gallery for art, is that it shall be in close connection with laboratories where the apparatus can be used, presided over by experts who are familiarly acquainted with its construction and uses.

This was the ideal recommended to the Government by the Duke of Devonshire's Commission in 1874, and such is the ideal now being carried out by several of our provincial Colleges.

As all Londoners know, at present the Science Schools and the collection of scientific apparatus, which are both necessary for the realization of this scheme, are placed one on the east side of Exhibition Road, and the other chiefly in the Western Galleries. If the apparatus is employed in teaching, it must necessarily be transported about a quarter of a mile and back from the one to the other. And this accounts for the strange processions occasionally met in the neighbourhood of the Museum carrying delicate apparatus along the street alike in wet and dusty weather.

When the new piece of land was purchased last year on the recommendation of a very strong Treasury Committee, it was naturally expected that, as the overcrowded state of the existing school buildings rendered immediate action imperative, plans would be at once drawn up for an extension in the closest possible contiguity with the present building—that is to say, on the part of the newly-acquired plot immediately fronting it.

It was also believed that the Science Museum would be built in close and organic relation with the new laboratories, and that a scheme would be initiated which would supply pressing needs, and could, in course of time, be developed into the ideal institution which has been sketched.

These plans, to the carrying out of which the friends of science confidently looked forward, would be rendered absolutely futile by the grant for art purposes of the particular plot the alienation of which from the use for which it was purchased will render the objects of its purchase nugatory.

All hope of a compact site, therefore, for the future worthy representation of physical science would disappear as the result of this action of the Government.

The public have a right to know who is responsible for this, and how far the scientific officers of the Science and Art Department have been consulted. If they have in any way been consenting parties, it seems probable that they will have a *mauvais quart d'heure* with their scientific brethren who have signed the memorial and who attended the deputation; if they have not been consulted, the whole transaction is a disgrace to our administrative system.

An idea of the *impasse* in which this decision has landed matters scientific at South Kensington was to be gathered from one of Mr. Goschen's replies as to the makeshift arrangements at first proposed:—

(1) The second half of the Science Schools is to be built somewhere at the back of the new Art Gallery. This at once prevents all close relationship between the two halves of the same institution.

(2) The scientific apparatus is to be distributed in galleries which, although built for artistic purposes, are not considered good enough for art.

These, I presume, are the Western Gallery, the present *terminus a quo* of the processions to which reference has been made, a corresponding Eastern Gallery, now occupied by the Indian Museum, and the upper part of a new gallery, also designed for art, situated between the Imperial Institute and the Royal College of Music. All these galleries are as far removed as the limits of the Government estate will permit from the Science Schools, with which they are supposed to be in organic connection.

It appears, therefore, that the provision to be made for the Science Museum, which ought to rank, and in the future must rank, with the British Museum, the National Gallery, and other like institutions, is that the two halves of the Science Schools are to be widely sundered, while any organic connection with the Science Museum is to be rendered impossible.

I do not think, Sir, I need occupy any more of your space with recent history; the whole question stands thus:—

(1) In our museum system Art, Antiquities, Literature, and Natural History are magnificently provided for.

(2) Science is not provided for at all in any permanent manner.

(3) During the last twenty years Royal Commissions, Treasury and Departmental Committees without number, and deputations, have pointed out this gap.

(4) Last year the Government bought, and the Royal Commissioners for the Exhibition of 1851 sold cheap, a plot of land to be used for this purpose, and for this purpose alone.

(5) The plot is less than half of that on which the Natural History Museum stands.

(6) The Government now barter away a large portion of this small site for a mess of pottage.

I am, Sir,
Your obedient servant,
F.R.S.

NOTES.

THE ladies' *soirée* of the Royal Society will take place on Wednesday, June 17.

ON Tuesday the Convocation of the University of London considered the Draft Charter drawn up by the Senate. A resolution to the effect that the scheme should be approved was moved by Lord Herschell, seconded by Sir Richard Quain, and supported by Dr. Pye Smith. Mr. Bompas, Q.C., Mr. R. H. Hutton, and others spoke on the other side. In the end the scheme was rejected, 461 voting against it, and only 197 recording their votes in its favour. The whole subject needs to be thoroughly reconsidered, as the question of the higher teaching, one of the points first insisted on, seems to be dropping out of view. To educationists this is, of course, the really important element of the subject; and it cannot be for ever tolerated that the existence of an Imperial Examining Board, because it has been wrongly named, should prevent the largest city in the world from securing educational advantages which have for centuries been possessed by many a small German town.

THE Government of New South Wales have granted for the purposes of the Sydney Biological Station a plot of land of two acres on the north shore of Port Jackson at a part where the littoral fauna is particularly rich, and where the conditions are in other respects highly favourable. The Royal Society have made a grant of £50 towards the cost of the proposed new station.

THE annual meeting of the German Ornithological Society is being held this year at Frankfort, and the attendance is somewhat larger than usual, as several ornithologists have stopped at Frankfort on their way to the Congress at Budapest. The subject of zoological nomenclature was considered on Tuesday, when a discussion on the rules proposed by Dr. Reichenow and Graf von Berlepsch ensued. The question will be further considered at the forthcoming Ornithological Congress at Budapest, where Dr. Reichenow will be the exponent in the systematic section.

THE *conversazione* of the Society of Arts will be held at the South Kensington Museum on Wednesday evening, June 17.

M. EDMOND BECQUEREL, son, and successor as Professor, of Antoine César Becquerel, died on Monday, in Paris, at the age of 71. He was the author of treatises on the solar spectrum, the electric light, magnetic phenomena, and other scientific subjects.

PROF. JAMES GEIKIE, of the University of Edinburgh, has been delivering a course of lectures at the Lowell Institute, Boston, on Europe during and after the Ice Age. The course began on March 13 and ended on April 10.

A SHOCK of earthquake was felt at Athens on Monday evening.

THE fourth summer meeting of University Extension and other students, to be held at Oxford in August, will be divided into two parts. The first part of the meeting will begin with an inaugural lecture by Mr. Frederic Harrison on Friday evening, July 31, and will end on Tuesday evening, August 11. The second part of the meeting will begin on Wednesday morning, August 12, and end on Monday evening, August 31. In natural science fifty-nine lectures will be delivered, and there will be classes for practical work in the University laboratory and observatory, &c. Among the scientific lecturers will be Mr. E. B. Poulton, Prof. A. H. Green, Mr. W. E. Plummer, and Mr. C. Carus-Wilson. Scholarships to the value of £120 have been offered by various gentlemen for the purpose of enabling University Extension students, who would not otherwise be enabled to afford it, to study for a short time at Oxford.

A GLASS case just placed in the Mammal Gallery of the British Museum contains a series of specimens of two of the largest species of Asiatic Wild Sheep, collected and presented to the nation by Mr. St. George Littledale, the well-known sportsman. Three of these represent Marco Polo's Sheep (*Ovis poli*) from the Pamir Range, and three of them the Ammon (*Ovis ammon*) of the Altai. These are, we believe, the first perfect specimens of *Ovis poli*, the finest and largest of all the Asiatic Sheep, that have yet been brought to England, the species been generally known only by its horns, which are remarkable for their enormous size and width.

THE Australasian Association for the Advancement of Science has published the Report of its second meeting, held at Melbourne in January 1890. The volume is edited by Prof. W. Baldwin Spencer. No one who glances over the volume can fail to recognize that the Association is likely to exercise a most important influence on the development of scientific research and thought among our kinsfolk in the Australasian colonies.

THE Ealing Microscopical and Natural History Society, of which the Rev. G. Henslow is President, has issued its Report and Proceedings for 1890. The Committee are able to record that the work of the Society proceeded quietly but steadily on the lines laid down in previous years; the evening meetings, the excursions, and the *conversazione* having all been held in their appointed seasons, and having had a full measure of success. Among the subjects brought before the evening meetings were "Adventures in Siberia," by Mr. H. Seebohm; "The Natural History of Malta," by the Rev. G. Henslow; "Diatoms," by Mr. E. M. Nelson; and "A Gossip on Mushrooms and Toadstools," by Dr. M. C. Cooke.

DURING the last fortnight, according to the Cairo correspondent of the *Times*, there have been in Upper and Lower Egypt large swarms of locusts, which have caused much alarm, as it is believed that they originate from eggs laid in the country last year. The damage done to the young maize, sugar, and cotton is as yet insignificant, though some individual growers have had to re-sow cotton patches which had been devastated. The provincial Mudirs have received orders to do everything in their power to secure the extermination of the locusts. The correspondent says that this is the most serious reappearance of an old Egyptian plague that has been recorded for about forty years.

A CIRCULAR relating to certain alterations in the Science and Art Directory for the session 1891-92 has been issued to managers of schools of science and art by the Lords of the Committee of Council on Education. The following is an outline of the alterations, so far as they refer to science, or to science and art together:—(1) Subject 6—Theoretical Mechanics—will be treated in two subdivisions: (*a*) the mechanics of solids, and (*b*) the mechanics of fluids—liquids and gases—payments being made on each subdivision as a separate subject. Subject 8—Sound, Light, and Heat—will be treated in three subdivisions in the advanced and honours stages, which may be taken, and will be paid upon, separately. The elementary stage will still include all three subjects, but the syllabus will be curtailed and rendered easier, especially in "Sound." (2) These subdivisions will not be considered as separate subjects in the interpretation of the rule which limits the number of subjects on which payments may be made on a student in any one year. (3) The number of National Scholarships in science to be competed for each year will be increased from 14 to 22. (6) In both science and art, the prizes of books, as distinguished from certificates, will be largely reduced in number, and only given in competition; those prizes which are now awarded simply on the student attaining a certain standard of excellence in the examinations being abolished. The time has passed when such prizes from a central authority, which entail a disproportionate cost and delay in administration, were justified by the necessity for stimulating science and art schools; and the Lords of the Committee of Council on Education are of opinion that the scholarships which will be substituted for them will be more useful. They trust that those interested in education in the several localities will themselves provide prizes of books for deserving students which may be useful to them in their studies.

ACCORDING to the Indian papers, a persistent effort is being made by the Geological Department of the Government of India, in association with the Burmah Government, to explore the tin resources of Tenasserim. The flourishing condition of the almost adjacent Malay States of Perak and Selangor, which are under British protection, is mainly due to the income derived from tin royalties. A year ago an expert was borrowed from the Straits Settlements and placed in Tenasserim under Mr. Hughes, of the Geological Department. The party has this year been joined by Dr. Warth, the officer who did very good work for the Government in the Punjab salt mines; and Dr. King, the Director of the Department, has left Calcutta for an inspection of the survey operations which have been conducted during the last twelve months. It is now two years since the Chief Commissioner of Burmah sent a special officer to report on the tin mines of the Straits Settlements, and the present explorations are being conducted in pursuance of the recommendations then made.

A PASSAGE in the correspondence of Leibnitz and John Bernoulli, to which Prof. Hellmann has recently called attention in the *Meteorologische Zeitschrift*, indicates that Leibnitz conceived the idea of the aneroid barometer, which was first practically realized by Vidi in 1847. Bernoulli, early in the eighteenth century, was considering the phosphorescence of mercury in the barometer, and the possibility of making a new instrument which would give the variations of air-pressure on a larger scale; also the idea of a barometer for travellers; and Leibnitz tells him he had thought of a portable barometer, without mercury, in which a metallic case should be compressed by the weight of the air. A bladder, or leather case, which he also suggested, Bernoulli considered would be too hygroscopic.

MESSRS. MACMILLAN AND CO. have just published "Natural Selection and Tropical Nature—Essays on Descriptive and Theoretical Biology," by Mr. Alfred Russel Wallace. The volume consists mainly of a reprint of two well-known volumes of essays—"Contributions to the Theory of Natural Selection," and "Tropical Nature and other Essays." Several essays have been either wholly or in part omitted. On the other hand, the author has included essays on the antiquity of man in North America, and on the debt of science to Darwin, which have hitherto been accessible only in the periodicals where they originally appeared. The text has been carefully corrected, and some important additions have been made.

A SUPPLEMENT to Dr. T. Lauder Brunton's "Text-book of Pharmacology, Therapeutics, and Materia Medica" has been issued by Messrs. Macmillan and Co. It presents the additions made in 1890 to the British Pharmacopœia of 1885. Although the medicinal substances contained in the British Pharmacopœia of 1885 are considered in the body of the work under the natural divisions of the mineral, vegetable, and animal kingdoms to which they belong, the author thinks it is easier to remember the additions by grouping them together according to their uses. A complete alphabetical list of them is also given.

A "BOTANICAL ADDRESS-BOOK" has been issued by the well-known Leipzig publisher, Wilhelm Engelmann. It contains a list of living botanists, and of botanical institutions, societies, and periodicals.

F. A. BROCKHAUS, of Leipzig, has issued a catalogue of scientific works which are offered for sale at his establishment. It includes, besides books, a large number of scientific periodicals and the publications of many learned societies.

THE 92nd and 93rd Parts of the "Länderkunde von Europa," edited by Alfred Kirchhoff, have been published. They present an excellent account of various parts of the Balkan Peninsula.

WILLING'S (late May's) useful "British and Irish Press Guide" for 1891 has been published. This is the eighteenth annual issue.

THE first number of a monthly journal for civil, mechanical, and electrical engineers, was published last week. The new journal is called the *Engineering Review*, and is edited by Mr. H. C. E. Andrée and Mr. Edward Walker.

AT the meeting of the Linnean Society of New South Wales on March 25, the Rev. Dr. W. Woolls read a paper on the classification of Eucalypts. After critically reviewing the characters of Eucalypts which have, from time to time, been made use of for classificatory purposes, more particularly those of the anthers and of the bark as set forth in the anthereal and cortical systems of Bentham and Mueller, the author suggested the probable value of a classification based on the characters of the fruit—such as shape, position of the capsules, the number of cells, and the appearance of the valves, &c.

CAPTAIN PETERSEN, of the Swedish barque *Eleanora*, noted a submarine earthquake in the volcanic region of the Atlantic west of St. Paul Rocks on March 13 between 7 and 8 p.m. According to a statement in the printed matter prepared for publication on the Pilot Chart of the North Atlantic Ocean for the present month, the ship was heading north-west, going about 3 knots, with a light easterly wind and calm sea, when a noise was heard on the port side, like a heavy surf, and almost immediately the sea began to bubble and boil like a huge kettle, the broken water reaching as high as the poop-deck. No distinct shock was felt, but after the disturbance struck the ship she continued to tremble as long as it lasted. After about an hour it ceased for an hour, and was then followed by another similar disturbance. A bubbling sound was all that could be heard, and the water appeared foamy, but it was impossible, on account of the darkness, to say whether it was muddy. The next day weather and sea were as usual. Position at 8 p.m., lat. 3° 47′ N., long. 42° 03′ W. The region from St. Paul Rocks to and including the Windward Islands is especially subject to earthquakes, and reports similar to the above are often received.

AT the ordinary meeting of the Institution of Civil Engineers on May 5, Mr. William Langdon read an interesting paper on railway-train lighting. He pointed out that the main questions to be determined were whether electricity was safe, trustworthy, and less costly than other illuminants. The fact that electrically-lighted trains had now been running for a considerable period without accident appeared to him conclusive evidence of its safety, and experience had shown that there was no reason to doubt its trustworthiness where efficient provision had been made; and he believed that when the cost of applying any of the illuminants, whether oil, gas, or electricity, to a complete railway system was taken into account the latter would be found the most economical. Regarding electricity as the illuminant which would, at no distant date, be universally employed for train lighting, Mr. Langdon suggested the desirability of arriving at a common basis with regard to the following fundamental points: (1) electrical system; (2) form and position of the electrical couplings; (3) pressure of current. Unless this was effected it was to be feared that unnecessary difficulties might be created by the diversity of the plans adopted.

MR. C. J. HANSSEN, a civil engineer of Copenhagen, has proposed a new international system of measures and weights, to which he invites our attention. He hopes that England will adopt his system, and that then the United States and Russia will follow, and thus the new system would become entirely international. Mr. Hanssen proposes that the English foot should be increased in length by about 1/2500th part of its present length (from 1·00000 to 1·000403); the pound avoirdupois, the ounce, and the imperial gallon, remaining unaltered. The cubic foot, as Mr. Hanssen states, would then contain exactly 1000 ounces of distilled water at 4° C.; and its inter-comparison with the metric units of weight, length, and volume, would become apparently easy. We fear, however, that there is little hope in this country of introducing any such new system. As Mr. Chaney has indicated in his report on the Metric Conference, there are only two things possible in the metrology of this country: either to adhere to the present Imperial system, or to introduce the metric system. No half-way or modified Imperial system, such as Mr. Hanssen would propose, appears to be possible.

THE Deutsche Seewarte has published, in vol. xiii. of its *Aus dem Archiv*, a paper by Captain C. H. Seemann, one of the assistants in that establishment, entitled "Weather Lexicon: an Index to the European Weather Charts from 1876–1885." The author considers that the principles we at present possess for forecasting the weather—*e.g.* Buys-Ballot's law, the relation of the tracks of depressions to the distribution of pressure and temperature, or the dependence of the lower air-currents upon the upper currents—are not sufficient for the purpose, and he has made an index of the various similar types of weather-charts. He has calculated the barometrical differences which occur each day in three directions: (1) from Hamburg towards the north-west (Stornoway); (2) from Hamburg to the south-west (Biarritz); and (3) from Hamburg to the north-east (Helsingfors); and, by knowing the difference for any day, a reference to a table of such differences shows the dates of other charts with similar conditions, so that, by selecting one which appears most suitable to the present conditions, we may judge of the probable weather from that which actually followed that particular type. In the paper in question, only barometer and wind have been taken into account; the distribution of temperature would, of course, have great influence upon the changes of weather, but the author preferred to postpone the consideration of that element in this primary classification.

In the new number of the Journal of the Bombay Natural History Society, Lieutenant H. E. Barnes continues his interesting papers on nesting in Western India. Speaking of house-sparrows, he says that no amount of persecution seems to deter them from building in a place when they have once made up their minds to it. At Deesa, he found that a pair had built a large nest in the antlers of a sambur in the veranda. Another pair made a nest in the soap-box in the bath-room, and although the nest was destroyed several times, they would not desist, and at last, "from sheer pity," he had to leave them alone. The most peculiar case was when a pair had a nest in a bird-cage hanging against the wall, just above where the "durzi" sat all day working, and close to a door through which people were passing in and out continually. The door of the cage had been left open, the previous occupant having been transferred elsewhere. Not only were four eggs laid, but the nestlings were reared, although the cage was frequently taken down to be shown to visitors. Once the eggs were nearly lost, a boy having taken them out. The fuss made by the birds led to the recovery of the eggs. The author has a curious note on another peculiarity of sparrows. "I have often," he says, "had to turn the face of a looking-glass to the wall to prevent them from injuring themselves, for immediately one of them catches a glimpse of himself in it, he commences a furious onslaught on what he imagines must be a rival, and, if not prevented, will continue fighting the whole day, only leaving off when darkness sets in, recommencing the battle at dawn the next day. I once tried to see how long it would be before the bird gave in, but after two days, seeing no likelihood of his retiring from the unequal contest, I took pity on him and had the glass covered up. The bird did not seem in any way exhausted, although I do not think that he had a morsel of food for two days."

Some remarkable electrical phenomena accompanying the production upon the large scale of solid carbon dioxide are described by Dr. Haussknecht, of Berlin, in the current number of the *Berichte* of the German Chemical Society. In order to obtain large quantities of solid carbonic acid it is found most convenient in practice to allow the liquid stored in the usual form of iron cylinder to escape into a stout canvas bag, best constructed of sail-cloth or some such strong fabric, instead of the usual lecture-room receiving apparatus, the cylinder being inclined from the vertical so as to permit of a ready and uniform exit from the opened valve. The liquid under these circumstances issues at pressures varying from 60–80 atmospheres, and a compact snow-like mass of solid carbon dioxide is formed in the canvas receiver, owing, as is well known, to the extreme lowering of the temperature of the liquid due to its sudden expansion and the accompanying absorption of heat. When the experiment is performed in the dark, the canvas receiver is seen to be illuminated within by a pale greenish-violet light, and Dr. Haussknecht states that electric sparks 10–20 cm. long dart out from the pores of the cloth. If the hand is held in these sparks the usual pricking sensation is felt, similar to that perceived on touching the conductor of an electric machine at work. Dr. Haussknecht further states that the phenomenon is very noticeable in the dark whenever there is a leakage in any portion of the compressing apparatus or the manometers connected therewith. The reason assigned for this development of statical electricity is similar in principle to that usually accepted in explanation of the hydro-electric machine of Sir William Armstrong. As the liquid carbonic acid is issuing from the valve it becomes partly converted into gas which is violently forced through every pore of the canvas. Moreover, carried along with this stream of gas are great quantities of minute globules of liquid, which are brought in forcible contact with the solid particles already deposited. Dr. Haussknecht therefore considers that the electrical excitation is due mainly to the violent friction between these liquid globules and the solid snow. It is very essential for the successful reproduction of these electrical phenomena that the carbon dioxide should be absolutely free from admixed air; that prepared artificially yielding much finer results than that obtained from natural waters, which latter contains considerable quantities of air. The luminosity is not generally developed in the interior of the receiver until a crust of solid carbonic acid 0·5–1 cm. thick has been deposited, which renders the probability of the correctness of the above theory all the greater. Dr. Haussknecht has constructed a special form of apparatus, with which he is now experimenting, with the view of being able to determine the sign, nature, and quantity of the generated electricity.

The additions to the Zoological Society's Gardens during the past week include two Brown Capuchins (*Cebus fatuellus* ♂ ♂), an Ocelot (*Felis pardalis*), a Coypu (*Myopotamus coypus*), two Ring-tailed Coatis (*Nasua rufa*), two Cayenne Lapwings (*Vanellus cayennensis*), seven Burrowing Owls (*Speotyto cunicularia*) from South America, presented by Mr. James Meldrum; a Pig-tailed Monkey (*Macacus nemestrinus* ♀) from Java, presented by Mr. C. Powell; a Common Hare (*Lepus europæus*), British, presented by Mr. H. T. Bowes; three Pintails (*Dafila acuta* ♂ ♂ ♀), European, a Mandarin Duck (*Æx galericulata* ♀) from China, presented by Mr. G. F. Mathews, R.N., F Z.S.; a Common Boa (*Boa constrictor*) from South America, presented by the Directors of the Museum, Demerara; two Cheer Pheasants (*Phasianus wallachii* ♂ ♀) from Northern India, twelve Common Teal (*Querquedula crecca*, 4 ♂, 8 ♀), European, purchased; a Viscacha (*Lagostomus trichodactylus*), a Red Kangaroo (*Macropus rufus*), born in the Gardens.

THE IRON AND STEEL INSTITUTE.

On Wednesday and Thursday of last week the annual spring meeting of the Iron and Steel Institute was held. The gathering was announced to extend over Friday also, but for some reason, best known to those who had the control of the meeting, the second day's proceedings were so hurried through that all the business was disposed of by half-past one o'clock on the second day; no less than six papers being taken at the one sitting. Naturally there was very little discussion; and indeed the second day of the meeting might almost as well have been dispensed with, and copies of the papers given to members to take home to read at their leisure. It is seldom that we have been present at a duller gathering than that which the meeting became towards its close, there not being a dozen members present to hear the Secretary hurry through the papers one after another, the President apparently being only anxious that there should be no discussion to prolong the proceedings.

The following is a list of the papers read:—On the manufacture of war material in the United States, by Mr. W. H. Jaques, of Bethlehem, U.S.A.; on tests for steel used in the manufacture of artillery, by Dr. Wm. Anderson, Director-General of Ordnance; on certain pyrometric measurements and the method of recording them, by Prof. Roberts-Austen, F.R.S.; on the changes in iron produced by thermal treatment, by Dr. E. J. Ball, London; on a graphic method of calculating the composition of furnace charges, by Mr. H. C. Jenkins; on economical puddling and puddling cinder, by Prof. Thomas Turner, Birmingham; on the micro-structure of steel, by M. Osmond, of Paris. There were three other papers which were not read.

Upon the members assembling in the theatre of the Institution of Civil Engineers, which was lent for the occasion by the Council of the latter Society, according to their hospitable custom, Sir James Kitson, the retiring President, occupied the chair. After the usual formal business had been transacted, the new President, Sir Frederick Abel, F.R.S., was duly installed, and at once proceeded to deliver his inaugural address. Sir Frederick is also this year President of the British Association, and should spend a busy autumn attending both the meeting of the Iron and Steel Institute in Birmingham, and of the Association in Cardiff. The address was of considerable length, embrac-